Identifying Key Information Systems Competences in Small Firms

Paul Cragg
Professor, Department of Accountancy, Finance and Information Systems,
College of Business and Economics, University of Canterbury, Christchurch 8020, New Zealand
Email: paul.cragg@canterbury.ac.nz

Abstract

The conference theme is 'developing management and organisational capability to improve business performance'. Rather than examine all types of organisational capability, this paper focuses on information systems (IS) competences, which can be viewed as a pre-requisite for building some organisational capabilities. The paper adopts a resource-based view of firms, which is an approach that has proved very useful in the study of information systems as the theory focuses on 'resources'. Important information system type resources include skills, knowledge and technology. Resources can be combined to create competences, and Peppard & Ward (2004) outlined a total of 26 IS competences that firms may develop. Their 26 competences cover a broad range of activities, including strategy formulation, defining IT needs, and creating and maintaining good relationships with suppliers. Their framework was used to examine factors that influence information systems success in small firms. The analysis identifies a set of ten competences that make a difference to information systems success in small firms.

Bio – Paul Cragg

Paul Cragg is Professor of Information Systems at the University of Canterbury, New Zealand. Since moving to New Zealand from England in 1980, most of his research has focused on small firms, including the adoption and use of the internet, the alignment of information systems with business strategies, benchmarking, and IT sophistication and success. He has presented findings from these studies at many conferences, including the 9th World Congress in Abu Dhabi in 2004. He has also published in a number of international journals, including MIS Quarterly, European Journal of Information Systems, Information & Management, and Entrepreneurship Theory and Practice.

Introduction

Small firms are important parts of most economies yet there is evidence that many small firms lack human information systems resources, particularly technical IS skills and managerial IS skills (Cragg, 2002). For example, firms require IS knowledge and skills so they can explore possible new technologies, tailor software to their needs, negotiate with IT suppliers, and co-operate with a software house in the development of software (Caldeira & Ward, 2002). Resource-based theory views such knowledge and skills as 'resources', and these resources have been identified as barriers to the adoption of new technologies as well as being important for IS success in small firms.

While various factors have been shown to influence IS adoption and IS success in small firms, these attempts have failed to provide sufficient understanding of the relationship between IS resources and firm performance. Resource-based theory (RBT) has recently been used to provide insights about how IS resources can influence firm performance (Ravichandran & Lertwongsatien, 2005). This paper adopts a resource-based view to examine evidence from small firms. The study identifies key resources and competences that influence small firm IS success.

Resource-based theory

The resource-based view (RBV), also known as resource-based theory (RBT), focuses on resources within organizations. The theory has proved useful by providing a way of analysing organization success, and particularly how firms can gain competitive advantage. RBT states that firms possess resources, and some of these resources help the firm achieve competitive advantage (Barney, 1991). For example, a brick manufacturer could have access to sand that enabled the firm to make a superior quality brick, which could lead to the firm obtaining a higher price in the market for their bricks. As well as physical resources, other common types of resources are skills and knowledge. In other words, resources can take many forms and do not have to be physical resources like buildings or quarries. Various resource typologies exist. For resources associated with information systems, Bharadwaj (2000) recognises three types of resource: Tangible resources (eg, physical IT infrastructure); Human IT resources (eg, technical IT skills, managerial IT skills); and Intangible IT-enabled resources (knowledge assets, customer orientation, and synergy).

An important element of resource-based theory is that only some resources will possess qualities that could provide a firm with competitive advantage. Barney (2006) summarises these qualities as: valuable, rare, imperfectly imitable, and non-substitutable. For example, a sand quarry could provide competitive advantage to a firm if it allowed the firm to compete (ie, it was valuable), was not possessed by other firms (ie, it was rare), could not be copied (ie, imperfectly imitable), and has no equivalent substitutes (ie, non-substitutable).

Key terms within RBT include resources, competences, and capabilities. As different literature has used these terms to mean different things, this paper uses the Peppard & Ward (2004) view that 'resources' are combined to form 'competences' at a functional level which are combined to form 'capabilities' at an organisational level. For example, Peppard & Ward (2004) discuss competences that are specific to the information systems area. These IS competences reflect "a bundle of skills and technologies rather than a single, discrete skill or technology" (Peppard & Ward, 2004). Thus, for example, a firm could combine knowledge and processes to develop the competency of ensuring that the firm identifies advantageous uses of information systems.

Information Systems Competences

A typology of information systems (IS) competences was proposed by Peppard & Ward (2004). They identified six competency domains that include a total of 26 IS competences that firms may develop. The full set of six domains and 26 competences is listed in Table 1.

The Peppard & Ward (2004) set of 26 IS competences is more extensive than other typologies as their 26 competences cover a broad range of activities, from strategy formulation through defining IT needs, to creating and maintaining good relationships with suppliers. Other typologies cover a narrower set of activities. For example, the 'capabilities' identified by Feeny & Willcocks (1998) assume that organisations use suppliers to outsource much of their IT service so their nine capabilities emphasise supplier relationships. There is no mention of the need to manage in-house development and maintenance, and little or no mention of managing service quality, unless from an external supplier. Furthermore, the Peppard & Ward (2004) framework was used by Cragg et al (2006) to report the existence of IS competences within nine small manufacturing firms. They found that some small firms possess many of the Peppard & Ward (2004) competences. However, in their small sample of firms, they found no evidence for about half of the 26 competences.

Competency Domain	IS Competences
1. formulate strategy	1. Business strategy 2. Technology innovation 3. Investment criteria 4. Information governance
2. define the IS contribution (IS strategy)	1. Prioritization 2. IS strategy alignment 3. Business process design 4. Business performance improvement 5. Systems and process innovation
3. define the IT capability (IT strategy)	1. Infrastructure development 2. Technology analysis 3. Sourcing strategies
4. exploitation	1. Benefits planning 2. Benefits delivery 3. Managing change
5. deliver solutions	1. Applications development 2. Service management 3. Information asset management 4. Implementation management 5. Apply technology 6. Business continuity and security
6. supply	1. Supplier relationships 2. Technology standards 3. Technology acquisition 4. Asset and cost management 5. IS/IT staff development

Table 1: The Peppard & Ward (2004) IS Competences.

Information Systems in Small Firms

Research in small firms indicates that both technical and managerial factors influence IS success (Cragg, 2002). This conclusion was based on an analysis of 30 small engineering firms with between 20 and 100 employees. A total of six practices differentiated IT leaders from IT laggards. Three practices reflected senior management involvement and the other three reflected technological capability. These six practices are described below and summarised in Tables 2 and 3.

The senior management involvement factor included managers working as a team, providing vision and leadership, and showing a willingness to explore new opportunities (Table 2). Although many managers have recognised the potential of IT, it takes time for other managers to be convinced and for appropriate processes and systems to evolve to fit the specificity of the particular firm.

The study found that technical capability was another significant factor that differentiated IT leaders from laggards. This recognises the importance of technical capability within small firms. Important aspects of technical capability are: system customisation, specialist IT skills, and system development expertise (Table 3).

Cragg (2002) also provided indications of how small firms develop their technical capability. The firms showed a preference to rely on internal IT expertise rather than external experts. Some small firms were able to do well without engaging an IT consultant. Instead, they preferred to manage IT projects themselves, including all contact with vendors. Their success was in part due to them gaining IT knowledge over the years, for example, from the experience of major system upgrades, from informal discussions with peers, and from reading management type magazines. Furthermore, many IT leaders had an internal IT expert who was expected to take a

significant role with IT projects. Some of these experts had their own informal, support network to turn to. Thus many of these firms have staff with good project management skills and high IT knowledge. The study showed that some small firms have built their IS technical capability and made consultants and vendors much less important to them.

Key managerial practices (Cragg, 2002)	**Practice description**	**Related IS competences** (Peppard & Ward, 2004)
Role of IT within the business	In leading firms, IT was viewed as strategic and provided considerable advantage over competitors. While in laggard firms, IT assisted with many processes but provided no or little advantage over competitors. Some firms use IT strategically and view IT as part of their competitive strategy. Some other firms have been inclined to see the role for IT as primarily operational.	1.1 – business strategy – ensure that business strategy formulation identifies the most advantageous uses of information, systems and technology. 2.2 – IS strategy alignment – ensure that IS development plans are integrated with organizational and functional strategic plans.
Senior management commitment to IT	In leading firms, all senior managers are enthusiastic about IT, regularly discuss IT issues, and share responsibility for IT projects when necessary. They actively lead IT. While in laggard firms, some senior managers prefer to ignore IT issues unless in a crisis.	4.1 – benefits planning – explicitly identify and plan to realize the benefits from IS investments. 4.3 – managing change - make the business and organizational changes required to maximise the benefits without detrimental impact on stakeholders.
Managers seek new uses for IT	In leading firms, senior managers regularly explore new uses for IT through discussions within and outside the firm, and at exhibitions and seminars, as part of the firm's commitment to continuous improvement. While in laggards, managers rarely explore possible new uses for IT.	1.2 – technology innovation – incorporate the potential of new and emerging technologies in long term business development. 2.5 – systems and process innovation - carry out relevant R&D into how IS/IT can be used to create new ways of conducting business and new products and/or services. 3.2 – technology analysis – understand technology trends and make appropriate recommendations for organizational acquisition of technology and associated resources.

Table 2: Key managerial factors and their related IS competences.

The six practices were evaluated using the list of 26 IS competences by Peppard & Ward (2004). The competences are reported in the right hand column of Tables 2 and 3. For example, the first key managerial practice, role of IT within the business, reflects two IS competences, business strategy (1.1) and IS strategy alignment (2.2). Each of the three key managerial factors reflected 2 or more IS competences. The results of this analysis are reported in Table 2. A similar analysis for the three key technical factors is reported in Table 3. Table 3 indicates a close fit between practices and competences, as each IS practice reflects just one IS competency.

Key technical practices (Cragg, 2002)	**Practice description**	**Related IS competences** (Peppard & Ward, 2004)

Customisation of new IT systems	The leading firms develop bespoke systems or packaged systems are purchased and undergo considerable customisation. While for laggards, packaged systems are purchased and undergo no or little customisation.	5.1- Applications development- develop/acquire and implement information, systems and technology solutions that satisfy business needs.
IT specialist	IT leaders employ an IT specialist with years of formal IT training. This makes the firm relatively independent of IT service providers. While in laggards, an employee with no formal IT training manages IT on a daily basis. IT problems are usually fixed by technical experts from another firm.	6.5 – IS/IT staff development – recruit, train and deploy appropriate staff and ensure technical, business and personal skills meet the needs of the organization.
IT development skills.	IT leaders have at least one person with hands-on IT development skills. These skills allow them to customise new systems, build small systems with database and spreadsheet software to meet specific needs, and fix some problems. In laggards, no person within the firm could develop small systems with either database or spreadsheet software.	5.5- apply technology – deploy new/changed technology in the most cost effective mode to deliver application benefits.

Table 3: Key technical factors and their related IS competences.

The analysis indicated that the managerial factor reflects seven of Peppard & Ward's 26 IS competences (1.1, 1.2, 2.2, 2.5, 3.2, 4.1, 4.3). The technical factor reflects three of the 26 IS competences (5.1, 5.5, and 6.5). The firms that had developed these competences were those that reported greatest impact from their IS. Thus this analysis indicates ten IS competences that make a difference to IS success in small firms. Some small firms have built IS competences that differentiate them from other small firms.

These specific competences indicate a number of best practices for small firms. For example, competency 1.1 is about a firm ensuring that business strategy formulation identifies the most advantageous uses of information, systems and technology. Some large organisations aim to achieve this through a rigorous IS planning process. Although planning tends to be less formal in small firms, one small firm addressed this by conducting an annual review of their IS. This annual review was presented to and signed off by the senior management team.

Competency 1.2 refers to technology innovation, where firms incorporate the potential of new and emerging technologies in long term business development.

Competency 2.2 refers to IS strategy alignment; ensuring that IS development plans are integrated with organizational and functional strategic plans.

Competency 2.5 is about systems and process innovation - carry out relevant R&D into how IS/IT can be used to create new ways of conducting business and new products and/or services.

Competency 3.2 is about technology analysis – understand technology trends and make appropriate recommendations for organizational acquisition of technology and associated resources.

Competency 4.1 reflects benefits planning – explicitly identify and plan to realize the benefits from IS investments.

Competency 4.3 reflects managing change - make the business and organizational changes required to maximise the benefits without detrimental impact on stakeholders.

Competency 5.1 reflects applications development - develop/acquire and implement information, systems and technology solutions that satisfy business needs.

Competency 5.5 reflects apply technology – deploy new/changed technology in the most cost effective mode to deliver application benefits.

Competency 6.5 reflects IS/IT staff development – recruit, train and deploy appropriate staff and ensure technical, business and personal skills meet the needs of the organization.

Conclusions

The above analysis has shown that the application of resource-based theory may help build a better understanding of the managerial and technical competences that make a difference to information systems success in small firms. A total of 10 IS competences were identified that influenced IS success in a sample of 30 small manufacturing firms.

This study provides an important step in attempting to identify which competences make a difference and thus which competences should be fostered within small firms. One next step is to examine ways that small firms could develop their IS competences and subsequently their IS capability. One way of increasing technical competences was proposed by Brown & Lockett (2004). They proposed that small firms should collaborate on IT initiatives rather than go it alone. They argue that IT providers can play a key role in helping groups of small firms build IT capability. Other types of collaboration have also been proposed to help small firms engage in e-commerce, including government led initiatives. Gengatharen & Standing (2005) examined a set of government-supported regional e-marketplace projects to conclude that such initiatives can succeed, ie, that more small firms can successfully adopt e-commerce.

The provision of courses and seminars is another approach to building IS competences. Studies, like this one, that identify significant IS competences could help to clearly define objectives for such courses and seminars. As the above conclusions were based on one study of 30 firms, the findings should be verified in other settings. Important research opportunities include: how do we build IS competences, and how do firms successfully turn IS competences into organisational capability?

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